In the United States Patent and Trademark Office

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Applicants(s): Jiang Lu and Samuel F. Azlein

Appn Title: Aerosol Splitter for ELSD

Examiner/GAU:________________________

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Information Disclosure Statement

Commissioner for Patents
Alexandria VA, 22313

Sir:

Attached is a completed Form PTO/SB/08(A&B) and copies of the pertinent parts of the references cited thereon. Following are comments on any non-English-language references pursuant to Rule 98:

In reference L1, page 3 Figure 1.1 of a manual from Alltech Associates, Inc. for the model 500 shows the configuration of a "full flow" instrument. Without a splitter, this instrument will become saturated with modest amount of difficult to evaporate mobile phase. This limitation is acknowledged on page 15 of the manual, where it is admitted that only very slow flow rates of some solvents (less than .5 ml/min) can be used. Unfortunately, many chromatography processes generate flow rates in excess of this amount.

In reference L2, O'Donahue et al. shows a method of improving evaporation for full flow instruments, by placing coiled stainless steel within the drift tube. This aids in evaporation up to a point, and helps with elimination of large droplets that can become noise spikes on the instrument baseline. However, the design is much more limited than an aerosol splitter, which addresses a fundamental limitation of full flow instruments. In full flow instruments, a saturation of the gas is rapidly reached as effluent flow rate increases. No matter how the drift tube is designed, this upper limit remains since it is imposed by physics. The gas exiting the nebulizer will only hold a certain quantity of

vapor in suspension, and this limit is well below the flow rates common in chromatography.

In reference L3, O'Donahue et al. again improves on a diffuser for a full flow instrument. Again, the upper limit remains for common flow rates of various solvents.

In reference L4, Anderson et al. demonstrate a removable spray chamber. This is a way of converting an instrument from full flow to split flow, and as such will avoid the saturation limit discussed above. However, this design obviously has only two settings: installed (split flow) and uninstalled (full flow). Mechanically, the device is cumbersome, requiring partial disassembly and reassembly of the ELSD for conversion. Our invention is a superior design due to its smoothly variable split ratios, and mechanical simplicity.

In reference L5, Benedict shows a way of achieving full flow and split flow without any mechanical disassembly. The impactor plate thus improves on previous art, but continues to have the limitation of only two settings. The change from full flow to split flow also relies on rotating parts, a motor, etc., which are mechanically complex and subject to failure.

In reference L6, Fig. 3, the gas flow path of a spray chamber typical of instruments from SEDERE is illustrated. As can be seen, there is a sharp reversal of gas flow direction. This reversal and the later restriction separate the larger droplets by impaction on the walls. Smaller and more nimble droplets follow the gas flow path and enter the evaporation tube (drift tube). This type of splitter, here referred to as a geometric type splitter, is always on. Because it passes less than the optimal amount of aerosol under many conditions, instrument sensitivity can be compromised.

Also in reference L6, an instrument from SEDERE has the above-cited nebulizer (spray) chamber surrounded by a water jacket. (fig. 5) While this appears to have some of the traits of the present invention, there are important differences:

1. The device is not designed as or used as a variable splitter. The function described in the manual is only to warm the spray chamber during use in Supercritical Fluid Chromatography (SFC). In SFC, the rapidly expanding Carbon Dioxide tends to create ice crystals that are problematic. According to page 17 of the manual, this chamber is warmed with circulating water to between 30° C and 40° C, and left there. Thus, unlike the present invention, no cooling (sub-ambient) function is cited. Also, unlike the present invention, no variable temperature function is cited.
2. The device would not function as a variable splitter, even if subjected to a wide range of temperatures, due to the shape of the spray chamber. The spray chamber is already configured as a geometric splitter and will remain so regardless of temperature. The path, shown in cross section in Fig. 3 and Fig. 4, has a reversal of gas flow direction that will always split all but the smallest droplets. The spray chamber of the present invention is a smooth curved path that can, by warming, simulate a straight path. With cooling, the spray

chamber of the present invention can simulate a much more severely bent path, similar to spray chamber of the SEDERE instrument. This approach is fundamentally different, since the present invention is variable over a wide dynamic range.

Very Respectfully

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Sam Azlein, Applicant

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	
Filing Date	2/23/2004
First Named Inventor	Jiang Lu
Art Unit	
Examiner Name	
Attorney Docket Number	LU_AZLEIN

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	L2	US- 6,151,113	11/21/2000	O'Donohue, et al.	all
	L3	US- 6,122,055	09/19/2002	O'Donohue, et al.	all
	L4	US- 6,362,880-B1	03/26/2002	Anderson, Jr. et al.	all
	L5	US- 6,229,605-B1	05/08/2001	Benedict	all
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FOREIGN PATENT DOCUMENTS

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Examiner Signature		Date Considered	

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Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	
				Filing Date	2/23/2004
				First Named Inventor	Jiang Lu
(Use as many sheets as necessary)				Art Unit	
				Examiner Name	
Sheet	2	of	2	Attorney Docket Number	LU_AZLEIN

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T^2
	L1	Alltech Model 500 ELSD Operating Manual, September 96, Pages 3, 15	
	L6	Sedex 55 ELSD Instruction Manual, 1984?, Pages 7, 15, 17,24	

Examiner Signature		Date Considered	

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